REQUEST FOR RECONSIDERATION

The present invention relates to semiconductor wafer processing. During plasma etching of a wafer, the temperature of the wafer increases. Since the etching process is temperature sensitive, it is desirable to control the temperature of the wafer as well as the uniformity of temperature across the wafer. A heat transfer gas, such as helium, is generally introduced into a space below the wafer in order to transfer heat between the wafer and the lower electrode. However, this system results in significant differences in the temperature of different parts of the wafer, particularly the center of the wafer as compared to its periphery.

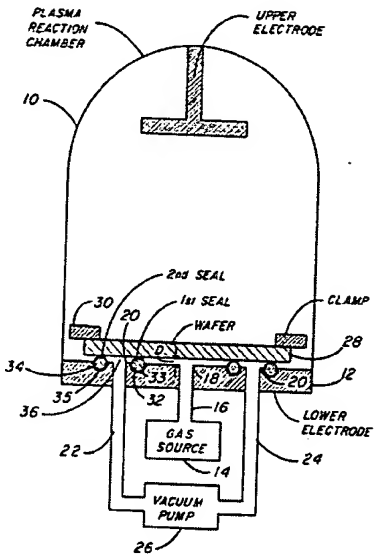
For example, U.S. Patent No. 5,698,070 (cited on Form 892 with the last Office Action) describes this very problem, in column 1, lines 26-33. Furthermore, this temperature differential is measured, as noted in column 10, lines 1-35. This reference describes an attempt to mitigate this problem by introducing an auxiliary gas to the peripheral portion of the wafer (col. 1, lines 40-52).

The present invention solves this problem, by transferring heat substantially uniformly across the substrate. The heat is transferred by both a heat transfer gas, and a seal. By closely matching the thermal conductivity of the heat transfer gas and the seal, the uniformity of the temperature, and therefore the etching rate, across the wafer can be maintained within an acceptable range.

The rejection of the claims under 35 U.S.C. § 102 over Cathey Jr., or under § 103 over Cathey, Jr. in view of Meyer et al. or Horiuchi et al., is respectfully traversed. There is no description or suggestion that the system of Cathey, Jr. results in transferring heat substantially uniformly across a substrate. Furthermore, there is no evidence that this result is inherent to Cathey, Jr.

Cathey, Jr. describe a method and apparatus useful in plasma etching. This reference describes helium backside cooling to improve heat transfer, filling high vacuum voids between the wafer and the supporting electrode (col. 2, lines 24-32). Two methods are noted: use of a single O-ring, and clamping without an O-ring (col. 2, lines 36-51). Cathey, Jr. then goes on to note the problem they wish to solve: keeping the helium (cooling gas) from exiting the region between the wafer and the electrode (col. 2, lines 52-59). **This** problem is solved by using two O-rings, creating two spaces,

the inner space for heat transfer, and the outer space kept under vacuum, allowing for **great r than ever** differential pressure (col. 2, line 62 to col. 3, line 3; and col. 3, lines 30-51). Note the illustration from Cathey, Jr. below.



Although Cathey Jr. is concerned with heat transfer, there is nothing indicating concern for uniformity of heat transfer across the wafer, or differential etching rates which result from non-uniformity of the temperature across the wafer. This problem does exists in these systems, however, as demonstrated by U.S. Patent No. 5,698,070 (described above) that indicates the existence of this problem in the very systems described by Cathey Jr. Furthermore, Cathey Jr. indicate that vacuum is a poor heat transfer path (col. 2, lines 15-20), and therefore inclusion of a vacuum region would be expected to be detrimental to uniform heat transfer across the wafer. (It is important to note that **total** heat transfer from the wafer may be sufficient keep the wafer from overheating, but that the temperature difference between parts of the wafer may nonetheless be large).

The present invention includes transferring heat from the substrate substantially uniformly across the substrate. This may be accomplished by closely matching the thermal conductivity of the heat transfer gas and the seal. There is no suggestion that the heat transfer from the substrate in Cathey Jr. is substantially uniform across the substrate.

No basis has been established for showing that Cathey Jr. inherently includes transferring heat from the substrate substantially uniformly. The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic (M.P.E.P. § 2112). Inherency may not be established by probabilities or possibilities; the mere fact that a certain thing may result from a given set of circumstances is not sufficient (M.P.E.P. § 2112). In relying upon the theory of inherency, a basis must be provided in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings (M.P.E.P. § 2112).

The system of Cathey Jr. is not the same as that described in the present specification for providing heat transfer substantially uniformly across the substrate. In the present specification, the thermal conductivity of the heat transfer gas and the seal are closely matched. No such matching is described in Cathey Jr. Furthermore, a very poor heat conductor is included between the substrate and the lower electrode in Cathy Jr. -- a region of vacuum. Accordingly, there is no basis for establishing that Cathey Jr. inherently transfers heat substantially uniformly across the substrate.

Meyer et al. or Horiuchi et al. have been cited to show elements of the dependent claims. Since the cited references fail to show or suggest transferring heat substantially uniformly across the substrate, the claimed invention is neither anticipated by, nor obvious over, the applied references. Withdrawal of this ground of rejection is respectfully requested.

Claims 41-43 are further distinguished from the applied references. These claims specify that only one seal is between the substrate and the support surface or lower electrode. Since Cathey Jr. requires two annular regions, one under vacuum and one filled with a heat transfer gas, at least two seals are required. Accordingly, these claims are further distinguished from the applied references.

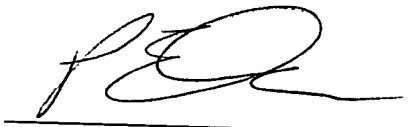
The rejection of claims 38-40 under 35 U.S.C. § 112, second paragraph is respectfully traversed. No essential steps are omitted from claims 38 and 39. M.P.E.P. § 2172.01 states that "[a] claim which omits matter **described to be essential to the invention** as described in the specification or in other statements of record may be rejected . . . ." (emphasis added). The "omitted" parts of these claims are not described

as essential in the present specification; rather, they are well known to those of ordinary skill in the art. Any parts that may be described as essential in the specification are included in claim 21, from which both these claims depend. Withdrawal of this ground of rejection is respectfully requested.

With regard to claim 40, applicant notes that the improvement is the presence of a seal (not present in the device described in the background section of the present specification). Furthermore, the structure of this seal is described functionally, as providing substantially uniform heat transfer across the substrate. Withdrawal of this ground of rejection is respectfully requested.

Applicant submits that the present application is in condition for allowance. Early notice of such action is earnestly solicited.

Respectfully submitted,



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